CHAPTER 3: POTENTIAL IMPACTS OF CBM WATER USE

For the purpose of this Technical Report, the primary intended use of the CBM water is for agriculture—principally crop irrigation, and possibly livestock watering. Other uses, such as landspreading, surface discharge, or subsurface injection, would basically be for disposal of the CBM water.

In this section, potential impacts are described. That is, general impacts that water can have on agricultural systems are described, but the specific impacts of CBM water on agricultural systems in the project area are *not* described until later in the report.

3.1 AGRICULTURAL IMPACTS

Potential uses of CBM water for which impacts could occur include irrigation and livestock watering. These uses are discussed in this section.

3.1.1 Agricultural Irrigation

The potential impacts from using water with relatively high salinity and/or SAR for crop irrigation are reduction in crop yields and/or damage to the structure of the soil. Also, some crops may be sensitive to certain trace elements that are present in relatively high concentrations in the irrigation water.

The reduction of crop yields from the use of high salinity water is typically caused by the inability of the crop's roots to extract the water from the soil for plant growth, causing a yield reduction. The increasing salt concentration in the soil water causes an increasing "pull" on the water that competes with the plant root's "pull", resulting in lower water (and nutrient) uptake by the plant. Different crops exhibit varying tolerances to this effect.

Damage to the soil structure can occur when the irrigation water contains a high amount of sodium in relation to the amounts of calcium and magnesium. The measure of this relationship is called the SAR. The application of water with a high SAR to the soil can cause the soil particles to disperse, which results in clogging of soil pores and sealing of the soil. The effect of elevated SAR is dependent on irrigation water salinity: the lower the salinity, the more potent the effect of high SAR. In this condition, the water cannot enter (infiltrate) the soil in sufficient amounts to provide water to the crop plants. Soils with higher percentages of clay are more vulnerable to this effect. This sealing can also cause excessive runoff and erosion.

Elevated levels of sodium in the irrigation water can also directly affect certain plants. This effect is most common when sprinkler irrigation is used. Irrigation water that wets plant leaves may cause specific ion toxicity problems. This occurs primarily during periods of high temperature and low humidity when excess chloride and sodium can accumulate on the leaves by foliar absorption. The more frequent the wetting and drying cycles, the greater the leaf damage. Many crops seem to tolerate salinity equally well during seed germination and later growth stages. However, the salt tolerance of some crops does change with growth stage (Maas and

Hoffman 1977). For example, barley, wheat and corn are more sensitive to salinity during early seedling growth than during germination or larger growth stages, while sugarbeets and safflower are relatively sensitive during germination. Tolerances can also vary between plant varieties, such as with soybeans.

The presence of relatively high concentrations of some trace elements (for example, boron) in the irrigation water can cause toxicity in some crop species. While this is typically rare for most groundwater, it should be considered with a new water supply.

3.1.2 Livestock Water

Water for livestock on the farm or ranch typically comes from the irrigation water source, or from water in drainageways and streams. Although it is rare, problems can occur from high salinity, high magnesium, or high levels of certain toxic substances in the livestock drinking water. These are discussed in more detail later in Section 4.1.2.

3.2 OTHER IMPACTS

Other potential impacts from using CBM water can occur. From the standpoint of the CBM water producer, these impacts relate basically to the disposal of CBM water rather than impacts resulting from its beneficial use. They include landspreading and surface discharge to drainageways or streams.

Landspreading would occur when the CBM water is released on the ground surface and allowed to seek its own outlet, or is released into a diked or pond area for percolation into the ground or evaporation. The potential impacts of these practices would include discharge of salts to the groundwater (depending on the rate of infiltration and effective recharge of usable groundwater) and accumulation of salt on the surface that would likely have to be disposed in accordance with specific regulations. Also, erosion and associated sedimentation could occur from the additional flow in the drainageways. Changes in drainageway hydrology, and the characteristics of the CBM water, would likely affect native plant communities' composition and levels of productivity, influencing terrestrial and riparian habitat. These influences could be positive in dry habitat, where water increases primary productivity, or adverse where CBM water quality decreases productivity. Additionally, the higher salinity and SAR in the CBM water could alter the quality of the receiving waters. This last effect is not addressed in this report, but rather in a complementary *Water Resources Technical Report* (ALL 2001). It should be noted that any changes in state surface waters that violate the Water Quality Act will require a Montana Pollutant Discharge Elimination System (MPDES) permit.

The actual construction of the CBM wells and peripheral facilities could also have a potential impact on area resources and land use. Erosion must be controlled when disturbing land during construction of roads, pipelines, and other facilities necessary for CBM production. Also, care must be taken to avoid transport of noxious weed propagules. New facilities can also reduce the quantity of land available for agricultural use for crops and livestock.